

soil health matters: GET MORE FROM COVER CROP MIXES

Natural Resources Conservation Service

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There's a reason most farmers who start with single species cover crops eventually move to mixes. There are multiple reasons they use a variety of plant species in a cover crop mix.

"Some of the most innovative cover crop users have continued to experiment with as many as 8 - 15 different cover crops in mixtures on their farms, to see what each contributes to their system," says David Lamm of the USDA Natural Resources Conservation Service (NRCS). "These farmers are breathing new life into their soils, with no-till and cover crop mixes, and they're telling us they're getting all kinds of benefits. A universal result is increased nutrient cycling, and in many cases a reduction in supplemental fertility is achievable."

Lamm, the leader for the NRCS National Soil Health and Sustainability Team in Greensboro, North Carolina, points to three of the top advantages to using mixtures:

1. No one species can deliver all the advantages multiple cover crops deliver in combination. Some fix nitrogen, some are very good at scavenging leftover nitrogen in the soil, and some have deep roots that extend benefits deeper into the soil profile. Still others help control specific weeds or attract beneficial insects, etc.
2. Each plant species offers a different chemical signature to the soil through the rhizosphere, which provides a different food source for bacteria and fungi in the soil. More variety in the food source creates the habitat for a greater variety of soil organisms—most of which have a positive impact within the soil.
3. Organic matter production is put on the fast track. A diversity of plants above ground creates underground habitat with a healthy balance of predator and prey organisms in the soil. The balance results in improved nutrient cycling.



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"We shouldn't be looking at the biomass produced above ground to measure success with cover crops," Lamm says. "We need to think about the organisms in the soil that cycle nutrients. Adding a diversity of roots to a soil that has seen only monoculture crops can awaken and ignite those organisms."

How many in the mix?

"The old saying 'the more the better' might apply to how much diversity could be beneficial in a cropping system," Lamm says. "The idea is to try to get plants representing four different functional groups in the system. These groups would be 1) warm-season grasses (corn, millet, sudex); 2) warm-season broad leaves (soybeans, buckwheat, sunflowers); 3) cool-season grasses (cereal rye, wheat, triticale); and 4) cool-season broadleaves (clovers, radishes, turnips)."

“Having two or three representatives from each group would be ideal, but there is a practical side to consider,” Lamm says. “Seed availability, cost, seeding methods, ability to terminate the plants and other factors enter into the number of species a farmer might use. Some studies suggest six to eight species from three of the four groups would be about right. Our NRCS plant materials centers are conducting a three-year study to look at this,” Lamm says.

Start with a 50:50 mix

A good start for cover crop mixtures is an equal rate of grasses and legumes. Then adjust the ratio according to the crop to be grown, Lamm says. “Cover crops are used with no-till, and we don’t want corn residues lying on the ground for more than a year.”

“So following a high-residue crop like corn with a high-residue cover crop like cereal rye might cause problems with the residue breaking down. Both crops have a high carbon-to-nitrogen ratio, which could tie up nitrogen. A cover crop mix with a legume—and a low carbon to nitrogen ratio—would help balance this out and ensure the residue is more rapidly decomposed into the soil,” he says.

Location matters for mix

Location dictates the amount of growing season available, so it should be considered when selecting varieties of cover crops. “Selecting a variety of clover that matures a week or two earlier, for instance, could pay dividends in the amount of nitrogen that’s available or how easily the cover crop can be terminated,” Lamm says.

There are a number of common mixes being recommended depending on the location in the country. For the northern Corn Belt, Lamm says a common mix is cereal rye, hairy vetch, winter peas and daikon radish. In the south and southeastern U.S., a common mix is cereal rye, hairy vetch, crimson clover, and daikon radish.

“But producers shouldn’t limit themselves to these mixes,” Lamm says. “They should continue to experiment to see what might work best on their farms.” He suggests interested farmers talk with farmers who have long-term experience. “North Dakota, Ohio and Indiana have shown some leadership, but I know there are a number of farmers across the country with experience in no-till and cover crops,” he says.

Lamm believes innovative farmers are ahead of researchers on cover crops. “I know there’s a need to look further into cover crop mixes, optimum seeding rates, best ways to terminate cover crops, how to best seed in a variety of situations, and other areas.”

A stable ecosystem

“We want to build soils like those that were formed under prairie conditions,” Lamm says. “And with no-till and cover crops, we can try to emulate the ecosystem functions of natural prairies. Prairies and prairie soils flourished with a diversity of plants, a minimum amount of disturbance, and living roots that grew throughout most of the year.”

These principles work together to create an ecosystem that is very stable. It captures solar energy and transfers it into the soil profile through the diverse plants, which in turn generates highly active life in the soil that produces nutrients and organic matter. That in turn allows the plants to grow to trap the solar energy, starting the cycle all over again.

“That’s a productive, environmentally friendly cycle, the kind of cycle farmers who want healthy soil are recreating,” Lamm says.

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